

REMARKS/ARGUMENTS

Claims 1-5 stand rejected in the outstanding Official Action. Claims 1, 4 and 5 have been amended and newly written claim 6 offered for consideration. Therefore, claims 1-6 are the only claims remaining in the application.

The Examiner's acknowledgment of Applicants' priority claim and receipt of the certified copy of the priority document is very much appreciated. Additionally, the Examiner's consideration of the prior art submitted in Applicants' previously filed Information Disclosure Statement is appreciated.

Claims 1-5 stand rejected under 35 USC §103 as unpatentable over Mehta (U.S. Patent 7,215,064) in view of Schwartz (U.S. Patent 7,053,737) and Hyman (U.S. Patent 6,504,118). The present invention as set forth in the pending claims is to provide a solution to the problem of sticking contacts in piezoelectric/electrostatic MEMS switches (see Applicants' specification, page 1, lines 21-25). Such MEMS switches utilize both electrostatic and piezoelectric actuation as disclosed in the Mehta prior art reference.

However, Applicants solve the problem of sticking electrical contacts by providing an armature which, when de-energized, is curved away from the fixed substrate contact. This way, even after electrostatic closure of the switch, there is substantial additional force in the piezoelectric material to break the contact when the switch is de-energized. Thus, Applicants' independent claims 1, 4 and 6 all specify an armature of curved shape which is bent away from the fixed contact when in a switch open condition with zero applied voltage. Actuation of the switch requires both the piezoelectric material to be bent towards the contact under its applied electrical voltage as well as electrostatic attraction between the armature and the substrate

pulling the movable contact into electrical connection with the fixed contact. Because the electrostatic force increases dramatically with decreases in distance between the electrostatic electrodes, once contact is made, the electrostatic force is sufficient to maintain contact.

However, when electrical actuation of the switch is terminated, in the present invention the contact between the fixed and movable electrodes is broken by the armature flexing away from the substrate because it has been de-energized and bends back to its original curved shape. A greater force flexing the armature away from contact is created by providing the piezoelectric material in the armature of a curved shape which is “bent away from the fixed contact when in a switch open condition with zero applied voltage.” Thus, Applicants’ invention solves the existing problem of sticking contacts in MEMS switch devices which use both piezoelectric and electrostatic forces for switching.

The Examiner suggests that the independent claims and claims dependent thereon are unpatentable over the Mehta/Schwartz/Hyman combination of references. The Examiner’s admission that “Mehta fails to teach that the armature is bent away from the fixed contact when in a switch open condition with zero applied voltage” is very much appreciated.

The Examiner observes that the Schwartz reference teaches a cantilever arm 130 which is bent. However, the arm in Schwartz is not the same armature recited in Applicants’ independent claim 1. Applicants’ armature not only is bent away from fixed contact as is the arm in Schwartz (which is operated only by electrostatic forces), but Applicants’ armature is comprised of a piezoelectric material which, in combination with the electrostatic electrodes, provides ease of engagement, i.e., bending towards the contact in order to close the switch, but this is achieved with significantly lower voltages.

Furthermore, Schwartz is not concerned with the problem of sticking electrical contacts and in fact is only concerned with the minimizing of “off-state capacitance” between electrical contact 134 and transmission line 114 without a corresponding increase in the electrostatic actuation voltage. This is discussed in Schwartz at column 3, lines 39-43. Another reason for providing a curved arm in Schwartz is to avoid sticking of the beam to the substrate “during drying,” i.e., during the process of forming the MEMS device and not during operation of the MEMS device. Thus, Schwartz is a solely electrostatic device and contains no recognition of the problem of sticking of electromechanical switches during their operation.

The Court of Appeals for the Federal Circuit has held in the case of *In re Rouffet*, 47 USPQ2d 1453, 1457-8 (Fed. Cir. 1998) that

to prevent the use of hindsight based on the invention to defeat patentability of the invention, this court **requires** the examiner to show a motivation to combine the references that create the case of obviousness. In other words, **the Examiner must show reasons** that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior art references for combination in the manner claimed. (emphasis added).

In order to establish a *prima facie* case of obviousness, as noted above, the Examiner must not only identify where the prior art teaches claimed structures and claimed interrelationships between structures, but the Examiner must identify some “reason” or “motivation” for combining the references.

In its recent decision, the U.S. Supreme Court in *KSR International Co. v. Teleflex Inc.*, 82 USPQ2d 1385 (April 2007), held that it is often necessary for a court to determine whether

there was an apparent reason to combine the known elements in the fashion claimed by the patent at issue and that “[t]o facilitate review, this analysis should be made explicit.” *Id.* at 1396.

The Supreme Court in its *KSR* decision went on to say that it followed the Court of Appeals for the Federal Circuit’s advice that “rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness” (the Supreme Court quoting from the Court of Appeals for the Federal Circuit in *In re Kahn*, 78 USPQ2d 1329 (Fed. Cir. 2006)).

Because Mehta, in an electrostatic/piezoelectric MEMS switch device, fails to teach the armature bent away from fixed contact and because Schwartz teaches an electrostatic only MEMS device with a bent arm (which is bent in order to solve problems other than the problem solved in the claimed invention), it is submitted that one of ordinary skill in the art would not have attempted to apply the Schwartz bent arm in an electrostatic only device to solve problems with a piezoelectric/electrostatic actuatable MEMS switch.

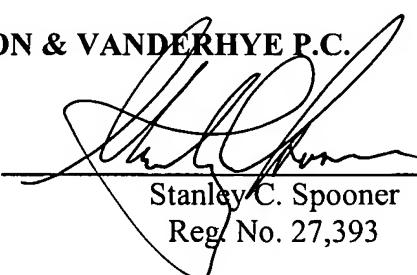
The Examiner provides only a conclusory statement that it would be obvious to one of ordinary skill in the art to add electrodes to the switch of Mehta in view of Schwartz (Official Action, page 4, 2nd paragraph). The Examiner provides no “reason” or “motivation” for extracting bits and pieces from the Mehta, Schwartz and Hyman references and then combining them in the manner of Applicants’ independent claims 1, 4 and 6. Accordingly, the Examiner has failed to meet his burden of establishing a *prima facie* case of obviousness under 35 USC §103 and any further rejection thereunder is respectfully traversed.

As discussed above, Applicants have rewritten apparatus claim 1 as newly written claim 6 in a form more in accordance with U.S. PTO patent claim practices and requests entry and consideration of newly written claim. This claim includes the features of independent claims 1 and 4, i.e., the utilization of both piezoelectric and electrostatic actuation and an armature which is bent away from switch contact. These features are simply not obvious to one of ordinary skill in the art in view of the Mehta/Schwartz/Hyman combination of references.

Having responded to all objections and rejections set forth in the outstanding Official Action, it is submitted that remaining claims 1-6 are in condition for allowance and notice to that effect is respectfully solicited. In the event the Examiner is of the opinion that a brief telephone or personal interview will facilitate allowance of one or more of the above claims, he is respectfully requested to contact Applicants' undersigned representative.

Respectfully submitted,

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